

Remarks

Claims 1, and 3-10, 12-14, 18-19, 22, 30-48 are pending in the application. New claims 36-48 find support in the specification, for example at pages 9 and 30-36. No new matter is introduced by this amendment. The Commissioner is authorized to charge excess claim fees and any other requisite fee associated with this paper, or credit any overpayment, to Deposit Account 20-1507. In the event a Petition for an extension of time is needed, this paper is to be considered such a Petition.

A. Rejections Under 35 U.S.C. §103

The Examiner rejected claims 1, 5-10, 13, 14, 22, 30, 34 and 35 under 35 U.S.C. § 103(a) as allegedly being obvious over Pinnavaia (U.S. Patent No. 6,017,632) in view of Clarey (U.S. Patent No. 6,050,509). The Examiner further rejected claims 3-4, 13, 18, and 31 as allegedly being obvious over Pinnavaia and/or Clarey, in view of Beal (U.S. Patent No. 5,552,469), and she further rejected claim 9 as allegedly being obvious over Pinnavaia, Clarey, and/or Beal, further in view of Nae (EP 681,990). Applicants respectfully traverse these rejections.

In rejecting the claims, the Examiner appears to have selected individual components from among the various references, from various sections of the disclosures, from various disparate embodiments, and/or from large genera, as needed, to match the individual elements of Applicants' claims. Applicants respectfully submit that the Examiner has failed to provide adequate motivation for the selection of the particular combination of components.

As the Examiner is aware, in order to establish a *prima facie* case of obviousness, the art of record must teach or at least suggest the particular combination of elements described in the invention as a whole. It is well established that a rejection may not be based on merely locating the individual elements of an Applicants' invention somewhere in the prior art. Rather, there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant. Furthermore, there must be a motivation or suggestion for each selection and/or modification required to combine the elements of the claims from the prior art. See *Yamanouchi Pharmaceutical v. Danbury Pharmaceutical*, 231 F.3d 1339, 1343-1345, 56 U.S.P.Q.2d 1649 (Fed Cir. 2000).

Obviousness Rejections Over Pinnavaia In View of Clarey

Claims 1-2, 5-8, 10-12, and 14-17 have been rejected as allegedly being obvious over Pinnavaia in view of Clarey.

Pinnavaia's invention and focus relate to the intercalation of clays (in their acidic form) with certain electrically neutral, organic, and basic "curing" agents, and the subsequent reactions of those intercalated clays with monomers to initiate polymerization/curing, to produce a large genus of nanocomposites comprising "cured" thermoset polymers, such as polyurethanes, polyureas, polysiloxanes, and alkyds (see column 10, lines 23-36). In a single paragraph in column 11, Pinnavaia also states that "All thermoplastic polymers can benefit from the disclosed technology." Pinnavaia then enumerates a list of 19 large genera of thermoplastic polymers to which his clay/intercalated curing agent technology, might apply, of which one subgenus is the polyamides recited by Applicants' pending claims.

The Office Action relies on Pinnavaia to make the nanocomposites of the present invention by (1) selecting the polyamides from the Markush group of thermoplastic polymers and (2) combining that selection with a single sentence from Example E2 regarding sedimentation of a clay sample to "remove" quartz. The "removal of quartz" from clays is mentioned nowhere in Pinnavaia except Example E2. Example E2 describes an unsuccessful attempt to prepare a nanocomposite via Pinnavaia's "technology" from a Na⁺ montmorillonite clay, in which "There was no observable intercalation of the clay by the curing agent and epoxy resin." Example E2 does mention, in a single sentence, removal of quartz. The relevant sentence reads, "The Na⁺ montmorillonite was purified by sedimentation to remove quartz and other dense, large grain contaminants." The only process mentioned in Pinnavaia was sedimentation, "to remove quartz and other dense, large grain contaminants." One of ordinary skill could not reasonably infer from this sentence that sedimentation "completely" removed or "eliminated" even "small" grains of quartz, or that any particular percentage of quartz removal was or will always be obtained, especially in view of the highly variable compositions of natural clay samples. The Examiner maintains that the difference between the present invention and the prior art of Pinnavaia is the explicit recitation of the numerical ranges for the quartz impurities in the clays. For this, the Examiner relies on Clarey.

Clarey is cited to demonstrate a method for purifying the clay component. In Clarey all types of impurities are removed from the clay material, including quartz. The Examiner reasons that, because clay is a part of the whole of removed impurities, and because the impurities are removed so that the clay contains less than 5 wt %, preferably less than about 1 wt%, then quartz, being only a small part of the impurity, must be present in less than 1 wt%.

The Examiner asserts that quartz was "removed completely" or "eliminated" from the clay. Applicants maintain that the term "removal" merely implies that some quartz was separated from the clay. Despite the Webster's definition of the term "remove," none of the other references cited by the Examiner (including Clarey) assert that all quartz is removable from clays as asserted in the Office Action. Moreover, Example E2 was unsuccessful in its attempt to employ Pinnavaia's curing agent technology, which would tend to lead one of ordinary skill away from attempting to apply its teachings to the present invention.

In Example E3, a "purified" Na⁺ montmorillonite clay was treated with NH₄⁺ cations, which were then intentionally thermally decomposed to produce an acidic form of the clay, then the clay was used in Example E4 to prepare "a conventional clay-epoxy composite." In Example E5, an example of an epoxy nanocomposite was prepared using the Pinnavaia "curing agent" technology and was compared with an epoxy-clay nanocomposite prepared from an Na⁺ montmorillonite clay that had been intercalated with alkyl ammonium ions. There is no indication in Example E5 as to whether or not the clays were "purified," and it is noted that the presence of the alkyl ammonium in clay gallery of the comparative sample "decreased the effectiveness of the clay reinforcement."

Applicants maintain that one of ordinary skill in the art would not read this sequence of examples and interpret them as teaching or suggesting the importance of "removal of quartz," or that "complete removal of quartz" was a significant part of Pinnavaia's technology. Moreover, this sequence of examples provides no suggestion or motivation to modify Pinnavaia's examples or technology to achieve any particular low total concentration of quartz such as the "less than about 2% by weight of quartz" recited by Applicants' claims, especially in view of the negative results obtained in Examples E2 for the Na⁺ montmorillonite clay nanocomposite, and the alkyl ammonium ion intercalated clay of Example E5. Accordingly, Applicants respectfully submit

that Pinnavaia does not represent the teachings purported by the Examiner.

Applicants' previous response pointed out that while Clarey discloses removal of generic impurities to the various particular levels, Clarey provides no specific teachings regarding the quantities of quartz impurities. The Examiner's rejections rely on combining Clarey with Pinnavaia to provide Applicants' claim limitations regarding "less than about 2% by weight of quartz." Clarey describes a method for purifying clays for use in nanocomposite applications to remove a variety of impurities. Although Clarey suggests that any clay can be purified, at column 3, line 60 through column 4 line 11 Clarey specifically remarks on the problems encountered in attempts to apply his purification methods to Na⁺ montmorillonite clays, and suggests such clays be converted to Ca²⁺ clays prior to purification by his method. Thus, one of ordinary skill in the art would have little, or perhaps even negative motivation with respect to the prospect of applying Clarey to modify the disclosures of Pinnavaia's examples, regarding Na⁺ montmorillonite clays, which themselves contain negative motivations, as described above.

Even if, *arguendo*, Pinnavaia and Clarey are combinable (which Applicants maintain they are not), Clarey does not provide a teaching or suggestion or any other basis to modify the *epoxy* nanocomposites of Pinnavaia. Thus, Clarey does not remedy the failure of Pinnavaia to teach or suggest the selection of polyamide polymers from any of the many other polymers generically disclosed by Pinnavaia.

The Examiner maintains that the combination of the two references would result in a nanocomposite composition "which would not adversely affect any properties. In fact the haze would be reduced." Applicants respectfully note that these statements contain hindsight-based embellishment of Clarey's teachings. Clarey teaches at column 1, lines 29-33 that "*exfoliated platelets*" may increase strength, temperature resistance, gas impermeability and other properties. He further teaches that clay impurities "caused a decrease in the properties that the platelets are designed to increase." Nowhere does Clarey specifically teach or suggest that quartz impurities contribute to "haze" or "discoloration," or degrade "transparency" or "clarity," or that the removal of quartz would improve these properties or gas impermeability. Therefore, the motivation to combine Pinnavaia and Clarey comes only from hindsight achieved by Applicants' disclosure.

Despite the lack of motivation for combining the references, Applicants submit the enclosed Declaration of Tie Lan showing unexpected and superior results over the teachings of these references. This Declaration was submitted in Lan's copending application U.S.S.N. 09/896,961.

The enclosed Declaration shows that the '632 patent to Pinnavaia contains about 3.5 wt% quartz. Additionally, data are provided showing that stretched films containing polyamide nanocomposites and having a comparable middle layer thickness have much less middle layer haze as the quartz content decreases. As stated in paragraph 10 of the Lan Declaration, these results are unexpected in the art of stretched films.

Obviousness Rejections Over Pinnavaia and Clarey, over Beall

The Examiner rejected claims 3-4, 13, 18, and 31 as being obvious in light of Pinnavaia and/or Clarey, in view of Beall. The Examiner asserts that it would have been obvious to use the specific polymers disclosed in Beall in the composition of Pinnavaia since Pinnavaia suggests using polyamides to make nanocomposites. Further, the Examiner notes that it would be obvious to utilize the resulting nanocomposite to form layered articles and that such layered articles "*would have reduced haze and decreased permeability.*"

In view of Applicants' discussion of the technical teachings of the references, Applicants maintain that the Examiner has not adequately identified or defined motivation or specific and convincing reasoning or knowledge in the art for combining the three references, nor for selecting the individual elements of Applicants' claims from any of the three references. Additionally, Applicants note that the unexpectedly superior results set forth in the Lan Declaration overcomes any obviousness suggested by the combination of references. Accordingly, Applicants respectfully request withdrawal of this ground of rejection.

Rejections Over Pinnavaia, Clarey, and Beau in View of Maxfield

Claims 12, 32 and 33 are rejected under 35 USC 103(a) as allegedly being obvious over Pinnavaia, Clarey, and/or Beall, in view of Nae (EP 681,990). Applicants maintain that this combination of references does no more than identify some of Applicants' claim elements in Nae. As previously stated, the mere identification of the various technical features of the claims in one or more references does not provide legally sufficient motivation to select the specific

combination of the features of the claims from the four references. There being no motivation to combine these references, Applicants respectfully traverse this ground of rejection.

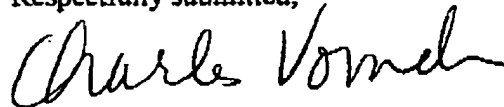
Overall, a showing that Pinnavaia, Clarey, Beall, and/or Nae renders Applicants' amended claims obvious would require the Examiner to at least show and support with objective evidence, that one of ordinary skill in the art would have motivation to select and combine, from the whole disclosure of Pinnavaia, in view of the other references (1) the sentence from Pinnavaia's Example E2 regarding sedimentation of clay, (2) modify the sedimentation mentioned by Pinnavaia to provide Applicants' limitation to "less than 2% quartz, (3) modify the epoxy polymers utilized in Examples E3-E6, and/or the general set of thermoset polymers emphasized by Pinnavaia, to employ (4) a specific selection of a polyamide from among the 19 classes of thermoplastic polymers. To produce a valid *prima facie* rejection for obviousness, there would need to be motivation or suggestion from some source for each of these selections and/or modifications. Motivation has not been shown for each of these selections, thus a rejection over the combination should be withdrawn.

Applicants note that claim 19 has not been rejected over any of the cited prior art. Applicants respectfully request that the Examiner indicate allowability of claim 19.

CONCLUSION

Pursuant to the above amendments and remarks, as well as the enclosed Declaration, Applicants request allowance of all pending claims.

Respectfully submitted,



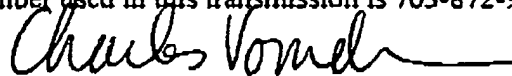
Charles Vorndran
Reg. No. 45,315

TROUTMAN SANDERS LLP
Bank of America Plaza
600 Peachtree Street
Atlanta, GA 30308
404-885-3813

Certificate of Facsimile Transmission

The undersigned hereby certifies that this Preliminary Amendment was transmitted to the U.S. Patent and Trademark Office via facsimile on **February 18, 2003**.

The facsimile number used in this transmission is 703-872-9311.



Charles Vorndran, Registration No. 45,315

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:

TIE LAN, ET AL.

Serial No. 09/896,961

Filed: June 29, 2001

Attorney Docket No.: 28682/71100

For:

LAYERED CLAY INTERCALATES
AND EXFOLIATES HAVING A LOW
QUARTZ CONTENT

Group Art Unit: 1714

Examiner: Wyrozubski-Lee, Katarzyna

Commissioner for Patents
Washington, DC 20231

Sir:

DECLARATION OF TIE LAN UNDER 37 CFR § 1.132

NOW comes Tie Lan, the first named inventor of the invention disclosed and claimed in the above-identified patent application and, after being duly sworn, states as follows:

1. I am the first named inventor of the invention disclosed and claimed in the above-identified patent application.

2. My education since high school is as follows:

BS Chemistry - 1986 Beijing University, Beijing, China
MS Chemistry - 1989 Beijing University, Beijing, China
Ph.D. Chemistry - 1993 Michigan State University, East Lansing, MI
"Pot/mmt-Clay Nanocomposites"

BEST AVAILABLE COPY

3. My work experience is as follows:

1995-1996	Research Associate	Michigan State University
1996-1998	Research Scientist	Nanocor, Inc.
1999-present	R&D Manager	Nanocor, Inc.

4. Publications:

More than 40 papers and patents on polymer-clay nanocomposites.

5. I have read the first Office Action dated January 16, 2002 and am a co-inventor of the Pinnavaia and Lan U.S. Patent No. 6,017,632 ('632).

6. The '632 patent, in Example E2 (col. 19, lines 13-14) generally discloses the purification of clay, for use in making nanocomposite compositions, by sedimentation to remove quartz and other dense, large grain contaminants. Purification by sedimentation will not result in a clay having a quartz content less than about 2.0% by weight, as claimed in this application.

7. I am a co-inventor of US-6,017,632, and I carried out most of the lab work for the examples. Currently, I still have a sample of the clay used in the examples for US-6,017,632. The clay sample was lab purified, as described in Example E2 of US-6,017,632. Recently, we carried out an XRD quartz determination on the clay sample, based on the same method we used to evaluate the quartz content of clay in this application and the quartz content of the clay used in the '631 patent was found to be 3.5 wt%. This result shows that the lab purified monmorillonite of the '631 patent has a relatively high quartz content, which is close to the Comparative Example 1f in our application 09/896961.

8. As set forth throughout this application, a quartz content below about 2.0% by weight is extremely important when manufacturing a nanocomposite film that is stretched (as in stretch blow molding bottles) since the stretching process creates voids adjacent quartz impurities which contributes to haze (see page 1, lines 23-35 and page 2, lines 1 and 2 of this application).

9. The following data, set forth in Table 2, page 40, of this application clearly shows the unexpected results achieved by forming a stretched film from a nanocomposite

BEST AVAILABLE COPY

containing a polyamide oligomer or polymer and clay containing less than about 2.0% by weight quartz:

TABLE 2

Example	NanomatType	Quartz Wt.(%)	Ash (%)	Middle Layer Thickness (mils)	Middle Layer Haze
2a	NA-047-00	0.33	2.2	1.63	8.6
2b	NX-041-00A	0.55	2.1	1.68	8.1
2c	NX-039-00A	0.79	2.6	1.58	12.4
2d	NV-049-00	1.58	2	1.8	13.9
2e	NN-049-00	1.93	2.1	1.8	14.8
Comparative Example 1f	NN-195-99	3.7	2.5	1.7	29
2g	None	0	0	1.7	0.9

10. As shown in the above Table 2, Comparative Example 1f contains 3.7 wt. % quartz (approximately the same quartz content as the clay used in the '632 patent) resulting in a haze value of 29. Applicants' example 2a, containing 1.93 wt. % quartz (as claimed) resulted in a haze value of 14.8 - the '632 nanocomposite composition has about 55.4% more haze than applicants Example 2a. At 0.55 wt. % quartz (Example 2b) the haze value is 8.1 - the '632 patent composition containing about 181.7% more haze than the composition of applicants' Example 2b. These results are most unexpected in the art of stretched films.

11. All statements made herein of my own knowledge are true, and that all statements made upon information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like, so made are punishable by fine or imprisonment, or both, under section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the instant patent application or any patent issuing thereon.

7/16/2002

Date

Tie Lan

BEST AVAILABLE COPY